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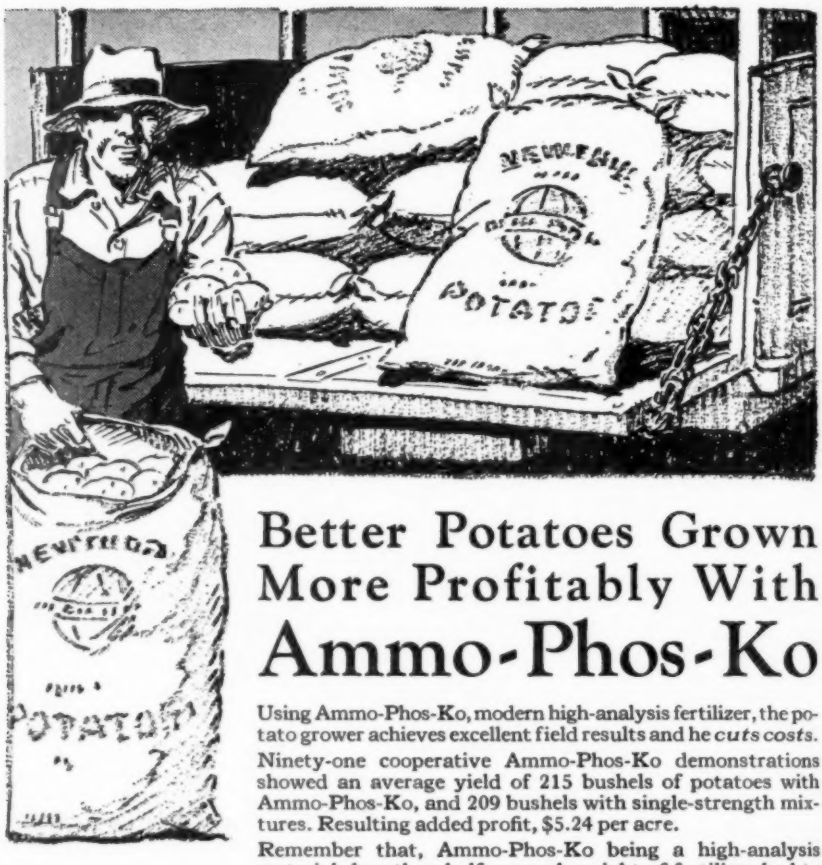

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The Value of Small Potatoes for Seed Purposes

JOHN BUSHNELL,

Experiment Station, Wooster, Ohio

It is obvious that small potatoes from any field are more likely to be diseased than the large tubers. For this reason seed certification authorities, anxious to maintain the highest possible standards, have hesitated to issue tags for the small sizes from a field that has passed certification.

That small potatoes are excellent for seed if they are free from disease is also generally conceded. Small tubers do not produce an excessive number of sprouts. Small tubers produce a crop grading very nearly as high a percentage of marketable sizes as the crop from cut pieces. Experimental comparisons have, on the average, shown as high yields from small tubers as from cut pieces.

For example, F. C. Stewart reported an elaborate experiment in New York Bulletin 491, in which the yield from whole small tubers was compared with that of cut pieces of large tubers from the same plants. The results in bushels per acre were:

	Large	Small	Total
Average yield from cut pieces	263	14	277
Average yield from small tubers	285	22	307

He concluded "that, for seed purposes, uncut tubers between one and two ounces in weight are at least as good as, and probably a little better than, pieces of equal weight cut from large tubers of the same plant."

Wm. Stuart and his co-workers in the U. S. Department of

Agriculture made comparisons at four diverse potato centers. They used good seed, sorted it according to weight of the individual tubers and then cut each tuber either into quarters or halves or left it whole. As shown in Table I, in some instances the whole tubers gave the higher yield and in others the cut pieces, with an average slightly in favor of the cut pieces.

In Ohio the question arose as to whether small potatoes from certified Michigan fields would be as satisfactory for seed as the regular marketable-sized certified stock. Samples of Russet Rurals were obtained directly from Michigan growers and tested at one or more points in Ohio. The small whole tubers were sorted to size so that 10 weighed a pound. The certified size was likewise cut so that 10 pieces weighed a pound. The results of these comparisons are given in Table 2. In 11 tests extending through five seasons, the small uncertified potatoes were practically equal to the cut certified seed, on the average giving slightly higher yields.

None of the samples in these Ohio tests showed a serious amount of disease that might have been carried on the tubers. This is in line with observations of large fields grown from small seed of this quality. If serious tuber-borne diseases are present at all, they are in such a low percentage as not to be noted by ordinary observation of the fields in Ohio.

Under some conditions whole tubers are decidedly superior to cut seed. On the silt soils of northeastern Ohio, hot, wet weather immediately after planting results in excessive rotting of cut seed and consequently reduced stands. Whole seed withstands such severe conditions better than cut seed. In addition there is the obvious advantage from the saving in labor of cutting.

It is not surprising then that small potatoes from certified fields find a ready sale in Ohio. But the fact that they do not carry certification tags makes the price somewhat lower than certified seed, and moreover the small potatoes are not as carefully graded. Occasionally stones occur in them, which raises havoc with the points of picker planters.

In view of the mass of evidence proving that small potatoes, if reasonably disease-free, are excellent seed, and in view of the ready markets at hand for such seed, it seems that the time is here for authorities to allow small seed to bear certification tags. Of course, it should be graded to the same standards as the regular grade, except for the size. If it was so tagged and graded, small seed would find a ready sale in Ohio at the same price as the U. S. No. 1 grade. In the writer's opinion it would soon command a premium.

Table 1

COMPARISON OF SMALL, WHOLE SEED WITH CUT SETS OF THE SAME WEIGHT

From U. S. Dept. Agr. Bul. 1248, 1924
Yield of Prime Potatoes in Bushels per Acre

State	Variety	Years of Test	Av. Wt. of Sets Oz.	Yield From: Cut Pieces	Yield From: Whole Tubers
Colorado	Rural New Yorker	2	1	271	272
Idaho	Chas. Downing	2	1	215	210
Idaho	Russet Burbank	2	1	217	233
Virginia	Irish Cobbler	4	2	258	221
Maine	Irish Cobbler	4	2	314	301
Maine	Green Mountain	2	2	190	183
Colorado	Rural New Yorker	2	2	305	325
Idaho	Russet Burbank	2	2	245	260
Idaho	Chas. Downing	2	2	239	206
	Average			251	246

Table 2

YIELDS IN OHIO FROM CUT CERTIFIED RUSSET RURALS AND SMALL WHOLE TUBERS FROM THE SAME SOURCE

Marketable Size Potatoes, in Bushes per Acre

Year	Locality	Sample No.	Yield From: Cut Seed	Yield From: Whole Seed
1925	Wooster	1	282	287
1925	Cuyahoga County	2	133	133
		3	141	127
1926	Cuyahoga County		208	239
1928	Cuyahoga County		175	200
1929	Wooster	1	171	194
		2	194	238
1929	Columbiana County	3	248	225
		4	237	215
1930	Cuyahoga County		215	215
1930	Wooster		193	188
	Average		200	207

Paring Waste of Maine Potatoes

MYRTLE WALKER DOW,

Agricultural Experiment Station, Orono, Maine

Culinary waste is the principal criterion used by the housewife in purchasing potatoes. "Good potatoes" to her means tubers of a certain size which may be prepared with as little waste as possible. The United States grades for this product have been defined largely on this basis. The validity of a purchasing standard which demands tubers above a certain size and free from defects rests on their greater economy and in their superior appearance on the table. At the University of Maine, a study of actual paring wastes of Maine potatoes of the Green Mountain variety as they appeared on the Boston market was made to determine (1) the actual amounts different factors contribute to this waste, and (2) the variations in total waste occurring in U. S. Grade No. 1, which includes the bulk of potatoes coming to market.

The method used in this study included hand paring with a special vegetable parer having a paring slit one millimeter (1/25 inch) in width. Thus the parings were approximately the same thickness. The waste due to each factor was weighed separately. Except in the study of eye depth, the eyes were considered as part of the paring, and were carefully removed with a sharp knife. The entire technique was such that it gave minimum wastes.

It was thought that normal variations in size, shape, and eye depth might cause considerable differences in total waste. In an effort to find the relationship of these factors to total paring waste, ten-tuber samples representing gradations of each factor to be studied, were pared by hand as if the tubers had no defects. The data secured follow.

RELATION OF SIZE (WEIGHT) OF TUBER TO PARING WASTE

For this experiment ten tubers of the same shape, which was that typical for the Green Mountain variety, were selected in each of three weight classes. This uniformity of shape was secured by choosing those within the limits of the following ratios:

$$\frac{\text{length}}{\text{width}} = 1.15 - 1.35; \quad \frac{\text{length}}{\text{depth}} = 1.45 - 1.65; \quad \frac{\text{width}}{\text{depth}} = 1.25 - 1.45.$$

The average wastes are summarized in the following table:

Weight class	Average grams before paring	Average per cent waste
4 oz. (98-126 gm.)	117.3	9.77±.051
6 oz. (154-182 gm.)	164.2	8.44±.119
8 oz. (210-238 gm.)	224.4	7.76±.055

It can be seen from these results that loss in hand paring decreases as size of tuber increases. This is true because surface area increases less rapidly than volume. The difference in loss between sizes would be even greater in average paring practices than with the technique of minimum paring used.

Uniformity of size is important in commercial machine paring because small potatoes are pared too deeply in the time required to pare large tubers properly.

RELATION OF SHAPE OF TUBERS TO PARING WASTE (SIZE CONSTANT)

To find the relation of shape to paring waste six ten-tuber samples of six-ounce potatoes (154-182 grams) were used, thus keeping the size uniform. The shapes chosen were spherical, cylindrical, concave, "pancake," misshapen, and the shape called typical. The terms spherical, cylindrical, and misshapen are self-explanatory. A concave potato is one that has one side concave or flattened and the other convex. The "pancake" potato tends to be a flattened sphere. The shape called typical has already been defined under the relation of size to paring waste.

Losses are summarized in the following table:

Shape	AVERAGE RATIOS			Average per cent waste
	Length/Width	Length/Depth	Width/Depth	
Spherical	1.01	1.18	1.17	7.33±.115
Cylindrical	1.84	2.22	1.21	7.90±.111
Concave	1.28*	1.70*	1.32*	7.22±.083
"Pancake"	1.23	1.83	1.50	7.01±.092
Misshapen	**	**	**	8.59±.140
Typical	1.20	1.56	1.31	8.44±.119

*Ratios not important in determining shape.
**Ratios not included because of range of measurements.

In careful hand paring, shape usually was not so important a factor as size in relation to paring waste. When the probable error is taken into account, in most cases the results overlap so much that no definite conclusions can be drawn.

Shape is a very important factor in machine paring, however. The abrasive parer tends to wear down knobs and irregularities and leave the potatoes round or oval-oblong in shape. Cylindrical, "pancake," misshapen, and concave potatoes are thus undesirable when commercial paring methods are used.

RELATION OF EYE DEPTH TO PARING WASTE

For the study of eye depth ten tuber samples of six-ounce potatoes of three varieties were used in order to give a greater range than could be obtained through the use of one variety alone. These tubers are not necessarily typical of the differences in eye depth for these varieties.

Depth of Eyes	Average Number of Eyes	Total Per cent Waste	Per cent Waste Due to Eyes	Per cent of Total Waste Due to Eyes
Deep (Bliss Triumph)	12.5	8.00±.099	1.42±.041	17.75
Medium (Cobbler).....	10.3	7.55±.112	.97±.044	12.85
Shallow (Green Mt.)..	11.8	7.33±.115	.40±.014	5.46

There is a decided difference in the average per cent of waste due to different depths of eyes. For practical purposes such a fraction of the total waste is relatively unimportant when compared with that due to some other factors, but it should be stressed that this was minimum hand paring. Moreover, in using a commercial paring machine there would be a tendency to hold potatoes with deep eyes in the machine for longer periods, thus resulting in considerably greater waste.

WASTE DUE TO DEFECTS* IN TUBERS AS DELIVERED ON THE BOSTON MARKET

Nineteen lots of potatoes of 25 pounds each were secured at the wholesale market in Boston on March 31, 1930. Thirteen of these samples were of U. S. Grade No. 1 from Maine; three from the Canadian Provinces; and three were miscellaneous lots. Samples of approximately ten pounds were selected from each

*The tubers were not halved, so that hollow heart damage was not included in this study.

lot, and pared by hand, using the method already outlined. The data obtained are summarized in Table 1.

The average waste for the Maine U. S. No. 1 grade potatoes was 13.48 per cent of which approximately one-third was due to defects. About one-half of the latter was due to cuts and bruises and the rots associated with them.

A wide variation in waste due to defects can occur under the present United States grade standards. With percentage waste, assuming no defects present, varying only from 8.06 to 10.44 per cent, the total waste ranged from 10.71 to 21.42 per cent. This was caused by a variation in waste due to defects from 0.78 to 12.25 per cent of the tubers. In other words, the percentage of the total waste due to defects in Maine samples of U. S. Grade No. 1 varied from 7.28 per cent to 57.19 per cent.

The average percentage of total waste in the Canadian sample was lower than that in the Maine samples. The percentage due to defects in Canadian samples was 19.68 per cent, as compared with the 28.08 per cent of the Maine samples. The scabby potatoes and the lot of pickouts had higher wastes, but it is interesting to discover that the total waste in the pickouts is less than one per cent higher than the average for the samples of U. S. Grade No. 1. The samples of Idaho potatoes gave the lowest total waste, 7.25 per cent. Only 7.50 per cent of this was due to defects.

A survey of twenty wholesalers on the Boston market in which they were asked what qualities their buyers sought in potatoes gave almost unanimously the reply that they looked for tubers which were smooth, that is, free from defects, and lots which did not contain small tubers. Therefore, it would be very desirable to reduce loss from cuts and bruises to a minimum and to grade out small potatoes. The actual waste plus added labor in paring and the disadvantage of poor appearance both before and after paring are at least sufficient to warrant study of methods to minimize damage. Such a study would be of great importance to the producer and indirectly to the consumer.

The wholesalers also wish to cater to the desire of the consumer for lots of potatoes containing few small tubers. Some have suggested that the U. S. Grade No. 1 should eliminate all potatoes below two inches in diameter. To see the effect of this on paring waste the original data on potatoes of the U. S. Grade No. 1 from Maine were studied and all potatoes below two inches in diameter were separated. The tubers above two inches in diameter in all of the Maine samples had only 78.8 per cent as much waste as those below two inches when the tubers were pared as if they had no defects. This leads to a definite correlation between the percentage of weight of the sample below

TABLE 1. Waste Due to Defects in Potatoes on the Boston Wholesale Market

Sample No.	Per cent Waste No Defects*	Total per cent Waste	Per cent of Total Waste Due to Defects	PER CENT WASTE										
				Bruises With Rot	Bruises Without Rot	Rot	Cuts With Rot	Cuts Without Rot	Scab	Sunburn	Growth Cracks	Over Grow'ths	Net Necrosis	Frost
Maine														
1	8.06	11.87	32.09	2.57	.12	.69	.04	.03	.02	.02	....	....	.26	.05
3	8.76	12.34	29.01	2.72	.06	.05	....	.43	....	.14	....	....	.03	15
4	8.73	16.09	45.74	1.24	.02	.02	.07	....	....	.10	....	....	5.65	.27
7	9.17	21.42	57.19	2.67	.08	.30	.06	.08	.06	.02	....	....	8.73	.26
8	9.05	12.25	26.12	2.35	.06	.22	.16	....	.06	.12	.01	.18	.05	....
11	10.22	13.79	25.96	2.42	.....	.93	.16	....	....	....	.02	....	.04	....
12	9.45	11.77	26.21	2.07	.02	.14	....	....	....	....	....	.03	.05	....
13	9.94	12.06	17.56	1.18	.02	.11	....	.02	....	.57	....	....	.12	.09
14	9.57	13.16	27.28	3.00	.05	.....	.01	....	....	.10	....	....	.06	.31
15	10.44	13.95	25.16	1.59	.06	....	.06	....	.03	....	....	....	1.77	....
17	9.68	14.49	33.19	2.80	.01	.46	....	....	....	.64	.02	.86	....	....
18	10.21	11.39	10.36	1.01	....	.02	....	....	....	....	....	....	.10	.06
19	9.93	10.71	7.28	.39	.04	....	.01	.02	....	....	....	....	.21	.10
Ave.	9.47	13.48	28.08	2.00	.04	.23	.04	.04	.01	.13	....	.08	1.31	.10
Provinces (3)**	9.76	12.23	19.68	1.14	.13	.85	.09	....	.01	.02	....	.02	.14	.01
Pickouts (1)	8.58	14.46	40.66	4.14	.13	.12	.36	....	.05	.03	.36	.16	.56	....
Scabby (1)	8.87	20.36	56.38	5.67	.02	1.85	....	....	2.57	1.09	.63	....	.27	....
Idaho (1)	6.71	7.25	7.50	.22	.10	.20	....	....	....	....	....	....	.02	....

*Surface paring as though there were no defects.
**No. of samples.

two inches in diameter and the percentage of paring waste. The proportion of the samples composed of tubers less than two inches in diameter varied from 1.16 to 12.58 per cent by weight. The tendency in other vegetables seems to be toward a closer grading for size. Probably this will eventually be brought about in order to meet consumer preference in grades for potatoes.

SUMMARY

1. The relative loss in hand paring of potatoes decreases with an increase in size of the tubers. Therefore large potatoes are more economical to pare. They are also more attractive in appearance than are small ones, at least up to certain size, varying with local and personal preferences and intended use. In machine paring uniformity is the most important quality so far as size is concerned.

2. Shape generally is not so important as size in affecting loss from hand paring but it is a very important factor in machine paring. Potatoes for commercial use should be of a regular and uniform shape.

3. Deep eyes may add ten per cent more to total paring waste than shallow eyes. For machine paring especially, shallow eyes are definitely preferable.

4. The variation in size and paring waste in different lots of potatoes graded as U. S. No. 1 is such that there seems to be a need for closer grading both with respect to size and defects.

5. A study of methods to minimize cuts and bruises and accompanying rot would be of great importance to both the producer and the consumer.

*Surface paring as though there were no defects.
**No. of samples.

The Limitations of Treatment for Potato Tubers Against Scab and Rhizoctonia

G. B. SANFORD, Dominion Laboratory of Plant Pathology, University of Alberta, Alberta, Can.

In 1930 potato growers were disappointed with the amount of common scab, and the loss in yield from undersized and mis-shapen tubers caused by rhizoctonia, and naturally are at a loss to understand why this should be after careful treatment of the tubers, or planting on land not used for potatoes for several years.

The common scab and rhizoctonia disease are perhaps the most difficult to control, or even check, by ordinary seed treatment. Consequently a brief explanation of the situation may be helpful.

Both scab and rhizoctonia are caused by fungi, each differing widely in growth characteristics, appearance and activity. The fungus causing common scab is very small, and is definitely restricted in growth when compared with the fungus causing rhizoctonia, the threads of which will grow quickly, and travel comparatively far in the soil. The scab fungus produces a great number of spores, which under favorable conditions help to spread or increase this fungus in the soil. The scab fungus penetrates the tiny breathing pores on the surface of the tuber where its action stimulates the formation of unsightly corky spots on the surface. On these spots spores may be seen at harvest. Many of these spores fall off in the harvesting operations, and reach the soil or unaffected tubers.

The rhizoctonia fungus attacks any part of the underground plant, cankering the stem or stolons, or russetting the tuber, the injury obviously depending on the depth of the tissue destroyed. When the stems or stolons are badly cankered, the plant becomes bushy, often faintly purplish at the top and small above-ground tubers form around the stem, and at the axil of the leaves. When the crop is dug the tubers may or may not have on their surface (depending largely on weather conditions) black dirt-like masses of the fungus adhereing tightly to the skin. Sometimes these masses are large and hard, or they may be small and loosely formed. These masses of fungi, if planted again on the set, will quickly grow through the soil to the young shoot, and later the other parts of the plant. Apparently clean tubers may carry threads of the rhizoctonia fungus on the surface.

To understand the limits of treatment, it must be remembered that both the scab and the rhizoctonia fungi are native to all normal soils where they are relatively abundant along with hundreds of other kinds of soil inhabiting fungi and bacteria. The mere cultivation of the soil, regardless of the crop, appears to increase these soil fungi, so that after a few years, from the virgin soil, one may get a large amount of either scab or rhizoctonia on the potato crop. For heavy infection of scab or rhizoctonia at least two things are necessary —the amount of either fungus in the soil must be great, and the conditions (temperature and moisture) for active growth must be favorable for them to reach the plant.

With scab there is a short time during the early formation of the tuber when the fungus appears to be able to enter the

breathing pores of the surface of the tuber with ease. If the soil becomes very dry during this period the potato may come through relatively clean, or even escape infection. An extremely wet soil during this period would also tend to check the growth of the fungus, and allow the potatoes to escape infection. Possibly soil conditions during the remainder of the season will not have much effect on the amount of scab. From this it may happen that scab is more severe in one part of the field than another, depending on differences in growth, soil moisture or amount of the organism.

In view of the information given let us now consider the limitations of seed treatment. Obviously we must conclude that the masses of rhizoctonia on the planted set should be killed, because of the active growth of this fungus, and the destructive possibility during the same season. But we must not forget that the plants may be severely attacked by the rhizoctonia fungus carried in the soil. Indeed, the injury from the rhizoctonia in the soil may far exceed that caused by any borne on the set.

With scab, the situation is quite different from the standpoint of the importance of scab on the set, because of the very restricted growth of the scab fungus during the crop season. Consequently the amount of scab appearing on a new crop must depend on the amount of the scab fungus normally in the soil. Hence, it would appear that a clean or scabby crop has practically no relation to the planting of scabby or clean sets that season as the case may be. One must also bear in mind that the amount of scab introduced by the set might be insignificant when compared to the amount of scab fungus already in the soil.

This note is simply to mention the natural limitations to effective tuber treatment against scab and rhizoctonia, and is not intended as an argument against the common practice in the use of either formaldehyde or corrosive sublimate solution.

Virus Diseases of Potatoes in British Columbia

WILLIAM NEWTON, Laboratory of Plant Pathology, Saanichton, B. C.

Long before virus diseases were accurately diagnozed and their infectious nature established, the farmers of British Columbia recognized that potato strains degenerated. It has now been definitely proven that potatoes do not degenerate,

do not run out, unless they are infected with virus diseases. I need not discuss the symptoms of mosaic, streak, leaf roll, spindle tuber and many other forms of virus diseases that exist in the province, for we have recently discovered that a potato plant may be infected by several forms of virus disease simultaneously. This condition may be expressed by disease symptoms quite different from the common virus diseases.

The farmers' problem is to eliminate as far as possible all virus diseases in his crop. Ample evidence has been obtained that yields are substantially lowered by mild mosaic and many other less conspicuous forms of virus diseases. Many of these forms are so difficult to diagnose, possibly because they are the expression of two or more forms attacking the plant simultaneously, that we believe it is better for the farmer to focus his attention upon the normal rather than upon the diseased plant. When once the farmer is familiar with the normal healthy type of the variety that he is growing, it is possible for him to keep down the amount of virus disease to a very low level by removing the "off-type" plants in his seed plot. There is only one general symptom of a virus infected potato plant. It is an "off-type" plant. As soon as we discover that the "off-type" character can be transmitted by aphids or by other means to normal plants, we brand the plant as virus infected. Such plants are a potential danger to the potato industry. The farmer has not the time to determine whether the "off-type" plants in his seed plot are capable of infecting normal plants. His safety lies in the destruction of these "rogues"as soon as they appear. A delay might prove costly.

Do Virus Infected Potatoes Recover?

There still persists the view that "run out" potatoes recover if grown in certain districts. All experimental work up to the present disproves this view. Although certain types of virus diseases are masked in certain districts and apparently have but slight effect upon yields, the disease is always present in just as active a form as in the districts where it can readily be detected. There are certain districts in the East Kootenay where virus diseases are difficult to detect, but even in these districts although the yields are not conspicuously reduced there is nó doubt that if virus infected and virus free seed were grown side by side, a difference in favor of virus disease free seed could be noted. A very extensive investigation by the Minnesota pathologists proved that 100% infected potato seed was in later generations always 100% infected regardless of where the seed was grown. Our own investigations confirm these results. It does not always happen that 25% virus infected tubers remain 25% infected in later generations. Sometimes the disease increases and sometimes it decreases.

It is easy enough to explain why it increases, but it is not so apparent why the amount of virus infected tubers should diminish when the potatoes are grown in certain districts. In districts where there are no aphids or other insects that transmit virus diseases from plant to plant, the proportion of disease free tubers tends to increase from year to year, for the virus infected plants yield fewer tubers than the normal plant. This process of improvement is so slow and uncertain that it is hardly worth mentioning, even if we were certain that districts exist where virus diseases do not spread from plant to plant. The modern farmer can rely only upon "certified seed potatoes." In this connection we conducted an experiment using small and large commercial seed, not certified. We found that the percentage of virus disease was much greater in the crop from the small seed than in the crop from the large seed. This confirmed our view that virus infected plants are usually unthrifty, producing a larger proportion of small seed than the normal plant. When certified seed was used, there was no difference in the amount of disease in large compared with small seed.

Digging Date and Rhizoctonia Control of Potatoes

R. R. HURST, Laboratory of Plant Pathology, Charlottetown, P. E. I.

Rhizoctonia is one of the most troublesome diseases of potatoes, and while its control is usually sought by treating the seed potatoes, nevertheless, additional importance is attached to the dates upon which the crop is harvested. Investigations conducted by the Division of Botany, have demonstrated the influence of digging dates upon the occurrence of the rhizoctonia sclerotia which indicates the presence of disease on potato tubers. These sclerotia are simply the winter or resting stage of the rhizoctonia fungus and their development depends, to a considerable extent, upon the conditions prevailing at digging time, for it is generally agreed that moisture and low temperatures stimulate the fungus threads to form up into the characteristic knots or sclerotia. It is apparent, therefore, that anything which will divert these natural influences, will, like-

wise, render unnecessary seed treatment the following spring. This is what happens when the crop is dug early. In the Maritime Provinces digging operations usually begin about the fifteenth of September, which, in normal years, is about the time when the rhizoctonia fungus transforms into its resting stage.

These circumstances have been the basis of "Date of Digging" experiments at the Charlottetown Laboratory of Plant Pathology. The land chosen for these tests was known to be heavily infested with rhizoctonia, and, in order to secure the most accurate possible information, each digging date was represented by four replications arranged in a manner giving uniform spacing throughout the plots. These investigations showed that the earlier the digging dates, the less did rhizoctonia develop on the tubers. After September fifteenth the disease occurred commonly. The amount increasing directly with the lateness of the digging date. In the light of these observations, therefore, when determining the best time to harvest the potato crop, especially where this is to be used for seed, it would be advisable to keep in mind this phase of rhizoctonia control.

Treating Seed Potatoes

R. R. HURST, Laboratory of Plant Pathology, Charlottetown, P. E. I.

The aim of all potato growers is to produce the biggest and best crop at the lowest possible cost. This highly desirable condition is dependent upon a number of factors such as good soil, quality of seed, spraying and cultivation. However, while the importance of these features is unquestioned, very often the prospect of a good crop is ruined through neglect to practice seed treatment which is aimed to reduce the enormous losses and inconvenience caused by scab, black leg and rhizoctonia. Failure to treat for these diseases may result in soil contamination, poor stands, weak plants and a diseased crop. Where time and labor are the main objections to treating seed potatoes, products known as organic mercury compounds are now available. They are used as dips and at the concentra-

tions recommended by the manufacturers. Besides destroying the disease producing germs, organic mercury compounds have the added value of protecting seed-pieces from destructive rots which are largely responsible for poor stands, particularly when the early season is not favorable to the growth of young roots which establish the potato plant.

While the foregoing method has its merits, corrosive sublimate (bi-chloride of mercury) remains the standard disinfectant for seed potatoes. Investigations conducted by the Division of Botany, have demonstrated the efficiency of this method when the directions are followed carefully.

The bi-chloride treatment constitutes soaking seed potatoes for 1½ hours in a solution composed of 4 ounces of bi-chloride of mercury in 25 gallons of water. After each lot of four bushels has been soaked, ½ ounce of bi-chloride is dissolved in 1 quart of hot water, and added to the original solution and water added to replace any loss. This is necessary to maintain the strength of the solution. In the past it has been customary to treat as many as eight lots, adding an extra ½ ounce of bi-chloride after each soak. It has been demonstrated that the solution has no killing effect if used eight times, and even where the necessary precautions have been observed it is advisable to discard the solution when four lots of potatoes have been treated. Certain precautions will aid in preventing deterioration and render seed treatment more valuable. These are as follows:

1. Dissolve the bi-chloride in not less than one gallon of boiling hot water.

2. Wash the potatoes before treatment to remove dirt. (This is very important).

3. Have two clean casks with drain plugs at the bottom. When one soak is complete drain the solution into the second cask and clean the sediment out of the first. Use these casks alternately throughout treatment.

4. Dissolve all bi-chloride in boiling hot water.

5. When 12 to 16 bushels of potatoes have been treated make up a new solution.

6. Do not treat in bags.

7. If possible use rain water, or water known to be soft.

8. After treating put seed in a clean place to dry quickly.

9. If weather does not permit rapid drying wash the tubers off with water immediately after treatment.

not intended as an argument against the common practice in the use of either formaldehyde or corrosive sublimate solution.

Virus Diseases of Potatoes in British Columbia

WILLIAM NEWTON, Laboratory of Plant Pathology, Saanichton, B. C.

Long before virus diseases were accurately diagnozed and their infectious nature established, the farmers of British Columbia recognized that potato strains degenerated. It has now been definitely proven that potatoes do not degenerate,

Crop and Market News

FINAL CROP REPORT FOR 1930

(Contribution from the Bureau of Agricultural Economics)

The 1930 potato crop is estimated at 361,090,000 bushels, which is only slightly larger than the 359,048,000 bushels harvested in 1929. Assuming a population of 123,000,000 persons, the per capita production for the 1930 season is a little less than three bushels.

Greater differences, however, are shown by the geeographic divisions composed of various states. The North Atlantic States, with a crop of 116,867,000 bushels, show an increase of 2.6% over their 1929 production; the South Central States, with a crop of 22,654,000 bushels, show 2.7% increase compared with 1929, while Western States, with a production of 71,556,000 bushels, show an increase of 29.4%. Decreased production, compared with 1929, occurred in the North Central and the South Atlantic States, which show decreases of 11.9% and 12.2%, respectively. The largest decrease in bushels occurred in the West North Central States, where a 1930 crop of 112,554,000 bushels compares with a 1929 production of 125,098,000 bushels.

The total harvested acreage of 3,394,000 acres in 1930 was about 1.7% greater than that harvested in 1929, but was largely offset by an average yield per acre 1.2 bushels lower than the yield per acre in 1929. The average for the 1930 season was 106.4 bushels.

The December 1, 1930 farm price of potatoes averaged only 90c per bushel, compared with the average of $1.31 per bushel a year ago. This accounts for the total value of the 1930 potato crop being placed at $326,457,000, as against the $469,837,000 value placed upon the 1929 crop.

The report of holdings of potatoes on January 1 will not be ready until a few weeks later, but judging from past statistics the January figure is expected to be quite moderate. However, the 19 important late-crop states had, by mid-December, shipped only 86,000 cars of potatoes, compared with 92,000 the year before. Usually about half the total shipments for the season are completed by January 2. In view of the low prices this year, total forwardings of potatoes may not equal those of the 1929-30 season. Recent movement has been 500 cars daily.

Markets were weak in mid-December. Western potatoes seemed to be in a less favorable position than those in the East.

Idaho has an exceptionally heavy crop. Of all the important shipping districts, northern Maine alone was showing considerable strength. Maine has about 5,000,000 bushels less than in 1929, a reduction of 10%, and shipments to date have been about one-fifth lighter than those of last season. Prices everywhere were fully one-third below those of 1929. Shipping points in the West reported a decline of 50%, compared with the 1929-30 season. General range of f. o. b. prices was 90c to $1.55 per 100 pounds. Old-crop potatoes were jobbing in city markets at $1.70-$2.50 per 100 pounds, with barrels of new stock from Florida at $6-7. A slight upturn of prices occurred at shipping points by December 20, but no great improvement was expected until after January 1.

NORTHEASTERN CERTIFIED SEED POTATO CROP 9% LARGER THAN LAST YEAR

The officials in the Northeastern States and Provinces report that 35,688 acres of seed potatoes passed final inspection this season compared with the 44,586 acres entered in the spring and 34,116 acres passing final inspection last year. As compared with 1929 there were decreases in the acreage passing inspection this year in Maine, Vermont and Nova Scotia, but these reductions were offset by increases in New Hampshire, New York, New Brunswick and Prince Edward Island.

Production this year is estimated at 9,704,000 bushels or 8% more than the 8,926,000 bushels last year. There were increases in all variety totals except Smooth Rurals which show a small decrease.

In Maine yields were very much lower than last year. The size of tubers was generally smaller owing to a heavy infestation of late blight. However, the bulk of the potatoes showing rot were left in the fields and the crop is shipping with little trouble.

Vermont had an unusually long growing season; no killing frost was evident until October. There were many over-sized Green Mountain tubers but quality is exceptionally good owing to the mature condition of tubers at digging time. Practically no rot from late blight was evident this year.

Yields of Green Mountains in Northern New York were higher than last year while those in all other sections of the state were lower. Yields of Rurals were only fair. The growing season was characterized by a wet first half and an almost unprecedented drouth during the later months which culmi-

nated near the end. Northern sections were not much affected by the dry weather and blight rot is in evidence. Tubers are generally small in size.

New Brunswick had an ideal growing season and the quality of the crop is fair to good in most sections. Less plant disease than in previous years. There is a light crop of early varieties but above average production of lates. Dry rot appeared in only a few places this year.

Despite the extremely dry season in Nova Scotia both early and late varieties yielded well. Cobblers were of uneven quality; in some sections the tubers were small while in others they were large. Late varieties were generally excellent in quality and practically free from rot or blight.

The season was abnormally dry in Prince Edward Island which resulted in premature death of the plants. However, the yields for the most part were good. Very little late blight was present except in an occasional field which was not sprayed. The quality as well as size and shape of the tubers is good to excellent and everything is being harvested and stored in good condition. Considerable seed stock has already been shipped for seed and table use, which will likely leave a smaller quantity than usual in growers' hands available for spring deliveries.

C. D. STEVENS,
G. BURMEISTER,
Statisticians.
New England Crop Reporting Service, December 23, 1930.

Notes

CANADA

The total acreage of potatoes which passed field inspections with a view to certification, in 1930, was approximately 27,324 acres. The crop certified will amount to approximately five million bushels. The principal varieties are Irish Cobbler, 50 per cent of the total; Green Mountain, 36 per cent; Smooth Rurals, 4 per cent; Bliss Triumph, 3.6 per cent.

A new grade for "Certified Seed Grade Small Sized 1½-3 ounces" is now in effect. This grade is considered suitable only for commercial table stock production and is not recommended for foundation stock. The field standard, however, is the same as for the Extra No. 1 Grade.

A regulation is now in effect in Canada which makes it illegal to sell or offer, advertise, expose or hold in possession for sale, any potatoes in any manner or form described or designated as certified, inspected, registered, selected, disease-free, or otherwise indicating their suitability for seed purposes, unless such potatoes have been inspected in the field and after harvest by an inspector under the Destructive Insect and Pest Act and have been found sufficiently vigorous and free from serious diseases to warrant them being classed into either of the two following grades, viz: Certified Seed Potatoes Grade Extra No. 1, or Certified Seed Potatoes Grade Small Sized 1½-3 ounces only.

—JOHN TUCKER.

OHIO

Short Course for Potato Growers at Ohio State University

A two-day short course for potato growers was given November 19 to 21 at Ohio State University, by the horticultural department. The course was unique in that it aimed to give technical information rather than purely practical. Some of the subjects covered were: The anatomy of the potato plant, by Professor Gourley; healings of wounds, apical dominance, frost injury and the general physiology of the tuber, by Dr. John Bushnell; action of Bordeaux as an insecticide (note that this not the usual fungicidal viewpoint), Dr. Dwight DeLong, entomologist; effect of special conditions on the growth of the plant, Prof. E. B. Tussing; the physical properties of soils as affected by the exchange reactions of soil colloids, by Dr. Richard Bradfield, of the soils department.

No previous college training was required of those who attended, but it was evident that those who had some knowledge of chemistry and botany profited most. The course was admittedly something of an experiment, although it was patterned after a short course for fruit growers that has been highly successful.

—JOHN BUSHNELL.

MICHIGAN

Approximately 6,000 people attended the five district potato shows held in Michigan during October and November, 1930. These district shows are held as preliminary events to the State Potato Show to be held February 2-6, 1931, during Farmers' Week at Michigan State College.

Despite the condition of the growing season, a total of 1100 potato exhibits of high quality were entered in the five shows,

and prizes approximating $8,000 were offered for exhibits and contests.

The Top O' Michigan Show Association held its eighth Annual Show at Gaylord, October 29-30-31. This is the oldest district show association in the state and established a district record at the 1930 show with a total of 445 potato exhibits, a ten per cent increase over last year.

The Upper Peninsula Show Association held its Third Annual Potato Show at Escanaba, October 22-23-24. The Western Michigan Potato Show at Reed City and the Thumb of Michigan Show at Mayville were held November 5-6-7, being the Sixth Annual Show of these associations. The Third Annual Southwestern Michigan Potato Show was held at Kalamazoo, November 17-18-19, and included for the first time, muck crops as part of the show.

A total of about 500 growers entered the potato grading contest conducted by the State Department of Agriculture in connection with the Department's exhibit featuring potato grades.

Forty-two potato growers entered the Michigan Premier Potato Growers' Contest, the first state-wide event of its kind. District eliminations were held at each district show and from the winners of these events, Michigan's Premier Potato Grower will be selected in a final contest at the State Potato Show during Farmers' Week.

Michigan's district Potato Shows to date have proven successful and are of great value in creating widespread interest in the production of high quality potatoes in this state.

—J. J. BIRD.

IDAHO

Report November, 1930, Pacific Northwest Potato Committee

The annual Pacific Northwest Potato Show and Potato Growers' Conference were held in Spokane, November 19, 20 and 21. Growers and state and federal representatives from British Columbia, Oregon, Montana, Washington and Idaho attended this conference. The secretary gave a talk before the meeting, outlining the present economic situation particularly as related to potato production and marketing. He outlined in a general way the plan of work of the Pacific Northwest Potato Committee. To bring about a better understanding of the value and the more general use of the federal outlook reports as related to potato products, was declared to be the present job of this newly created service, to the end that disastrous glut years and years of under-planting of potatoes might be avoided.

Talks along the same line were given at the State Seed

Show at Nampa, Idaho, and before the Lions Luncheon Club in Spokane.

The early potato planting intentions reported by the U. S. Department of Agriculture, November 3, 1930, shows an increase in prospect of 11% in planting for 1931. Tabb's Potato Service for November 6 points out that most of this increase occurs in the South Central States and that the South Atlantic States, under the jurisdiction of the Interstate Early Potato Committee, are increasing very little. These sentences then follow: "It is self-evident that we need more interstate early potato committees. All of the southern growers will make more money if last season's acreage is adhered to."

Arrangements have been made with Julius H. Jacobsen, in charge of the Boise office of Bureau of Crop Estimates, for sending out the intentions to plant survey blanks to a very much enlarged list of potato farmers. Mailing lists of potato growers are to be secured with the cooperation of county agricultural agents, irrigation project managers, etc., and made ready for use in sending out the next intentions to plant survey blanks.

After the intention report, based on this survey, is issued the committees in the various states included in this project, will meet and outline a plan of procedure. If this report indicates an increase in planting approximating the increase reported for the Southern States, the question must be faced of "Just what are we going to do about it?"

There appears to be a general need for the recognition by business interests as well as by farmers that:

(1) Overproduction results in disastrously low prices to the producer.

(2) Overproduction of farm products is real and not imaginary.

(3) The immediate solution of overproduction rests in the concerted action of producers in decreasing the acreage planted.

(4) Federal intentions and outlook reports supply the necessary facts and statistics upon which can be based any move on the part of the industry to correct or alter the situation.

To bring about, through a campaign of education, the general recogntion of the value of these federal reports and to demonstrate how the use of these reports, through concerted action, can result in a benefit to the producer and industry in general, is the purpose of the Pacific Northwest Potato Committee. This is the job to be accomplished which will require the cooperation of all individuals and agencies concerned with the improvement of the potato industry in the Northwest States.

H. E. DROBISH, *Secretary.*

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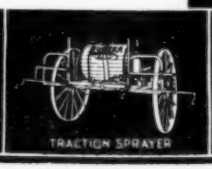

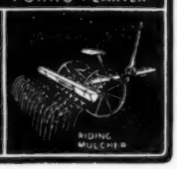

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